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## Abstract

Inscriptions represent data in different ways, and they also affect the reader in different ways. Photographs are believed to be realistic representations of the world, differing from graphs in their level of abstractness and their power of synthesizing complex information. The work of reading photographs is similar to the work of reading the world around us, which makes photographs easily accessible to audiences. This accessibility and perceived realism contribute to the power a photograph has in exerting a strong emotional impact on the public. Likewise, certain forms of qualitative, visual, arts-based and narrative *re-presentations* of research phenomena provide deeper levels of audience engagement with the “text”, and, depending on the purpose of our research, may be the most appropriate way for representing phenomena and providing *evidence* for our claims.

## Keywords

Inscriptions • Photographs • Social semiotics • Qualitative-quantitative distinction

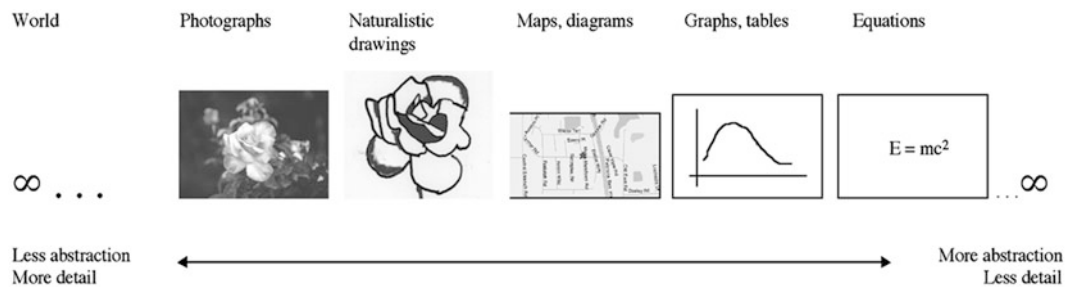
In educational research, numbers seem to be given a privileged position; *scientific* ways of representing research findings, such as graphs and tables, are still considered to be the preferred means of validating research and making its results credible. Inscriptions that represent mathematical, statistical information are taken as *evidence* for particular claims and facts research is attempting to establish. As Michael says in this volume, “The ultimate criterion for using this or that mathematization and representation practice is the strength of the evidence that can be achieved” (Roth, p. 512). The issue then becomes one of selecting what works best as evidence. The strength of the evidence, however, may not reside exclusively on its potential for validating a proposition emerging from the data, but also on its impact on the reader and consumer of research. Much like a photograph in a science textbook, the use of qualitative, visual, arts-based, and narrative approaches to research

in education can be very effective and powerful in communicating research findings, an outcome that numbers and graphs, no matter how powerful and “credible” they might be, are not equal to accomplish.

In this response piece, I discuss the work of interpreting photographs and its use and function in science textbooks as an allegory for a discussion of the appropriateness of different means of presenting *evidence* for our research claims. As Roth points out, “some inscriptions are better than others in making the phenomenon stand out” (p. 512); likewise, some forms of inquiry are better than others for investigating and providing *evidence* for a particular phenomenon, claim, or argument. Taking these positions as my point of departure, in this piece I explore the contention that it is the purpose of the research that should drive the choice of methods and the selection of the best way to *re-present* its results.

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**Fig. 67.1** Inscription continuum. *Note:* Towards the *left*, inscriptions become less abstract and present more contextual details; moving to the *right*, the opposite occurs, with inscriptions presenting more

complex information in more abstract form (Originally printed in Pozzer and Roth 2003)

## The Power of Photographs: Is a Picture Worth a Thousand Words?

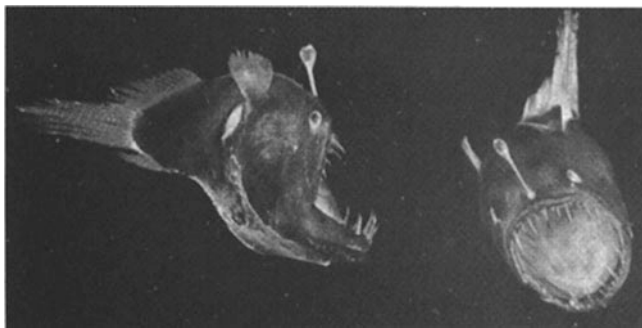
In my research on the prevalence and function of photographs in science textbooks (e.g., Pozzer and Roth 2003; Pozzer-Ardenghi and Roth 2005) I analyzed this type of inscription not as a self-evident and realistic representation of phenomena, but as a form of representation that requires particular types of interpretive work from the part of the readers in order for it to achieve its representational power. In the inscription continuum (Fig. 67.1), photographs occupy the leftmost position, closer to the observed, lived-in world. They are less abstract and contain more details than other inscriptions, such as graphs and tables, which are more abstract and can “pack” much more information than photographs. However, the amount of contextual details a photograph contains, which renders it more realistic, also creates innumerable possibilities for interpretation of what is to be seen in the photograph.

Arguably, the more details a photograph has, the more realistic it becomes in terms of specifying the “real-world” entity it is purportedly representing; however, the very details that provide for this specificity are also responsible for the inherent indeterminacy of meaning in the photograph. One can only identify the entity represented in the photograph if one already knows what it is representing. Take Fig. 67.2, for instance. This photograph originally appears in a biology high school textbook. The caption accompanying it reads, “Epiphyte plant.” Even when we do read the accompanying main text, which explains that an epiphyte plant is a plant that grows upon another plant, non-parasitically, we may still have doubts about what exactly is the epiphyte plant in this photograph. The amount of background details – what Bastide (1990) calls “gratuitous details” – makes the work of identifying the epiphyte plant in this photograph more difficult; however, these details also make the photograph appear more natural, providing clues for how epiphyte plants look like in their natural habitat.



**Fig. 67.2** Epiphyte photograph. *Note:* Photograph extracted from a high school textbook, where it was originally reproduced in colour. Even though the word “Orquidea” [orchid] can be seen in the *bottom right corner* of the picture, we still need to know in advance what an orchid looks like in its natural habitat to be able to see it in this image (Reproduced with permission from the copyright holder)

Thus, just as other forms of representation, photographs need to be accompanied by specific instructions to guide readers towards seeing the *evidence* it is providing. If the photograph in Fig. 67.2 is to be taken as evidence of what an epiphyte plant looks like in its natural habitat, readers must be guided through the various visual resources available in the photograph so that they are able to distinguish what *is* the epiphyte plant in this picture. Nonetheless, as a means to illustrate particular phenomena, photographs are still very powerful and widely used in science textbooks; indeed, they are the most abundant type of inscription in the biology textbooks we analyzed (Pozzer and Roth 2003). Part of the allure comes from the familiarity with which we engage in the interpretive practices required to read and make meaning out of a photograph; even if we do need guidance to appropriately identify specific items among various other items



**Fig. 67.3** Fish photograph. *Note:* Photograph extracted from a high school textbook, where it was originally reproduced in colour. The size of the fish in real life is almost the same size as it is represented in this picture (Reproduced with permission from the copyright holders)

depicted in a picture, the work of interpreting it is identical to the one that we routinely do in our everyday lives as we go about observing and making sense of the world. These interpretive practices differ quite drastically from the work of interpreting a Cartesian graph, for example. Even numerical tables require a shift from the everyday reading practices in which we engage in order for us to make meaning of them.

Photographs are also popular because of their perceived similarity to the objects or phenomena they represent; the subjective *making* of the photograph is usually ignored, and the camera is seen as an objective lens through which the world is faithfully depicted. Angle, light, and background can influence the way objects are represented in photographs and alter our perception of them. For example, the fish represented in Fig. 67.3 seems quite menacing, with its pointed teeth and wide mouth. Once we learn that it actually measures approximately 5 cm (that is, it is almost the same size as it appears on this page) and lives at a depth of 1,400 m in the ocean, we may reconsider our first impression of it.

Photographs might even be used to distort and “forge” the reality they are said to faithfully portray. While the issue has yet to be explored in educational research, a common example is the “touched-up” photographs in fashion magazines that distort not only the image (physical) of the models, but also the image (psychological) of millions of girls who aspire to a pattern of physical beauty that is completely unrealistic and unattainable.

While this example is well known for illustrating how photographs may be manipulated and manipulative, the deeper point is that photographs communicate more than information on a particular topic; most of the times, they (implicitly) communicate a way of living and perceiving the world. One must be *enculturated* into the practices of reading and interpreting photographs or any other type of inscription. Being used to *seeing* inscriptions everywhere is not the same as being *visually* or *inscriptionally literate*, especially in the context of science education, let alone in relation to fashion

photography. The reading work required to interpret a photograph such as the one in Fig. 67.2, for example, is dependent on conventional rules of perspective; competent readers use conventions of perspective to “see” trees on the two-dimensional picture. *Structuring* work of this type is mostly taken for granted when we read an inscription, becoming salient only when we face a breakdown, that is, when we experience difficulty in structuring the graphic representation from a conventional perspective (Roth et al. 2005). Structuring work is necessary for reading all types of inscriptions, but in educational contexts, structuring may be all that students are able to do when faced with unfamiliar inscriptions, especially more abstract ones such as graphs.

The apparent realism in the photographs, therefore, is a result of the readers’ interpretive work, rather than of the similarities between the two-dimensional representation and the actual object in the lived-in world, although these similarities account for the *concreteness* of photographs. To properly perform structuring work, the reader must be accustomed to the conventional rules of perception and representation that allows one to see a third dimension where only two are available. Even more complex, however, is the *translation* work between what can be seen in the photograph and the lived-in world. This type of interpretive work is dependent on cultural aspects and social experiences of the readers; without a cultural and social shared background, reading the inscription becomes that much more difficult (Poizzer-Ardenghi and Roth 2010).

Even though we realize that photographs are not self-evident and not necessarily *realistic*, the power of photographs to have an immediate impact on the reader is nevertheless undeniable. For instance, public and educational campaigns aiming to stop the killing of seals in Canada make use of photographs to send a strong message to their audiences, typically exerting a much stronger impact on the reader than the numbers that describe how many seals are killed every year. Seeing the seals – how small and defenseless they look in relation to their killers, and the instruments and “technique” used to kill them – is a powerful image that shocks many of us. Photographs can touch us deeply and stir our emotions; visual representations, because of their realistic features, appeal to our emotions in different and more powerful ways than numbers and statistics, and they are also often more readily accessible to the general public than mathematical forms of representation (Livingston 1995; Myers 1990).

### The Power of Non-numerical Evidence in Educational Research

Visual representations such as photographs may not be the most *scientific* means of representing research data, but they certainly have a strong impact on audiences. For one, they

are much more accessible and easy to read than graphs and statistical tables; photographs communicate a message in a glance: even without captions the reader is always capable of making some meaning out of it through *structuring* work. But most of all, their similarity with the lived-in-world allows us to *experience* phenomena in a way that other inscriptions simply cannot.

Likewise, visual, arts-based and narrative inquiry in educational research provide a *re-presentation* of social phenomena that is in many aspects superior to any type of quantification. The *evidence* in this form of inquiry is provided through representational means whose power resides exactly in their subjective nature and the emotional impact they exert on the reader/audience. Visual arts, dance, theatre and narrative forms of expression, such as poetry, for example, provide the audience with a level of engagement with the “text” that no amount of quantification can simulate. As with photographs, however, one must be enculturated into the practices associated with the different types of inquiry to be able to understand them and even to accept them as legitimate research. These practices differ not only methodologically, but also and most importantly, epistemologically, which makes it crucial for researchers, reviewers, evaluators, readers and consumers of research to be aware of the *audiences* and *purposes* of each type of inquiry.

The issue then becomes one of defining the purpose of our research, and selecting *evidence* appropriate to that particular purpose. In the same way in which numbers and graphs serve a particular purpose in providing *quantifiable* evidence for our research results, by validating them and making our claims more credible from an objectivist perspective, other forms of conducting and presenting research that do not rely on quantification may be a more powerful and strong way to get a message across to the audiences of the research, even if we are not interested in predictions, comparisons and generalizations, but rather in presenting the reader/audience with a more subjective and intimate *experience* of the phenomenon under investigation.

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## Conclusion

The various ways in which we choose to represent our world and the phenomenon we investigate in our research constitute different forms of *evidence* for our claims. What counts as *evidence* depends, in part, on the epistemological

perspectives underlying our inquiry, but it also depends on the purposes of our research. The power of non-numerical, non-quantifiable evidence resides on the subjective and emotional impact it can exert on the public, and the immediacy with which we are able to engage with these forms of representation. As Roth tells us in this volume (p. X), the strength of the evidence directs the type of representation to use, but it is the purpose of our research that dictates what counts as strong evidence for our research claims.

## Note on Contributor

Liliane Pozzer-Ardenghi is an Assistant Professor in the Faculty of Education, University of Manitoba. She completed her MA and PhD at the University of Victoria, where she studied the use of photographs in science textbooks and lectures, and the integration of verbal and nonverbal resources in classroom communication, in the context of science education. Recently, during her postdoctoral research at McGill University, she focused on socio-cultural aspects of classroom communication and interaction, including issues related to agency and identity. She is a co-author, together with Wolff-Michael Roth and Jae Young Han, of *Critical Graphicacy*, published by Springer, and author of *Staging and Performing Scientific Concepts: Lecturing is Thinking with Hands, Eyes, Body, & Signs*.

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